PICHINCHA: between Quito and Santo Domingo de los Colorados, km. 20, alt. 3400 m., *C. H. Dodson & L. B. Thien 1067* (US), Oct. 22, 1961.

Drew notes that the plant is medicinal and is locally called "turbata." Many leaves in *Drew E–113* and in *Ownbey 2618* are toothed with one to five teeth on each side of the leaf, below the apex.

Columellia lucida Danguy & Chermezon.

DISTRIBUTION: southwestern Colombia, Ecuador, and northern Peru. Occurrence of this species in Colombia and Peru has not been reported previously.

Colombia: *sine loco, Mutis "Cestrum, 175"* (US). The arbitrary number assigned by E. P. Killip to this collection is *2784*. The exact locality of collection is unknown; however, the vicinity of Ibagué or of Mariquita in the Cordillera Central may be considered as possible regions for Mutis's gathering [Hernandez de Alba, G. 1958. Diario de observaciones José Celestino Mutis (1760–1790). Tomo II. Instituto Colombiano de Cultura Hispanica. Bogotá. (*Cestrum*, pp. 51, 136–137)].

Peru. PIURA: prov. Huancabamba, Talanco Huaca, cerca á Huancabamba, monte bajo, alt. 3300 m., *C. Friedberg 240* (US), June 14, 1961. This specimen compares extremely well with the original description of *C. lucida*.

Columellia obovata Ruiz & Pavón.

DISTRIBUTION: Peru.

Peru. HUANCAVELICA: prov. Huancavelica, Huando [Mantaro Valley], entre Conaica y Huancavelica, estepa de gramíneas con arbustos dispersos, alt. 3650 m., *O. Továr 1266* (US), Apr. 6, 1953. APURIMAC: prov. Aymaraes, valley of Río Colcachaca at Cotarusi-Colca, ca. 1 km. above junction with Río Chalhuanca, ca. 15 km. (air) south of Chalhuanca, alt. ca. 3000–3100 m., *H. H. & C. M. Iltis, D. & V. Ugent 547* (US), Dec. 16, 1962.

These two collections document extensions of the range of this species in Peru. *Továr 1266* is represented by a branchlet with rather small, entire, apparently young leaves.

No taxonomic changes within the genus are indicated through our study of this additional material. It is still true, unfortunately, that our knowledge of the infrageneric taxa is incomplete owing to the relative sparsity of collections. Data from cytology would be extremely useful in resolving questions of infraspecific taxa.

At our request, Dr. Oscar D. Továr, Herbario San Marcos, Museo de Historia Natural, Lima, made and transmitted observations on the habitat of *Columellia* based on his collections (*4033*) of plants of *C. oblonga* subsp. *oblonga*: This subspecies is more or less frequent in the area of collection. The habitat is a subtropical, evergreen low forest called in Peru, "Ceja de la montaña." However, it is a little dry in comparison with the true "Ceja de la montaña" vegetation. The altitudinal distribution (of this vegetation?) is between 2600 and 3300 meters. The soil is more or less "humid," and rich in humus. Unfortunately, there are no annual records of temperature and rainfall kept for this region. The climate is temperate and on April 16, 1963, the minimum temperature was 10°C. and the maximum temperature was 24°C., in the shade. *C. oblonga* subsp. *oblonga* in this area grows with species of *Phenax*, Melastomataceae, *Befaria* and other Ericaceae, *Embothrium*, *Weinmannia*, *Desfontainea*, *Centropogon*, *Seemannia*, *Manettia*, *Rubus*, *Clusia*, and *Hesperomeles ferruginea*, as well as with other species.

Columellia obovata, represented by *Továr 1266*, is found in a different habitat from *C. oblonga* subsp. *oblonga*. The soil is drier and the vegetation is dominated by low, deciduous shrubs and other plants including species of *Baccharis*, *Minthostachys*, *Alonsoa*, *Calceolaria*, and *Monnina salicifolia*. Továr remarks that *C. obovata* is very rare in the Mantaro Valley zone and that at the time of collection, only this single specimen was seen.

The specimen of *Columellia obovata* collected by the Iltises and Ugents (*547*) is recorded from steep, very rocky (calcareous) south facing slopes with many cereus and opuntia cacti, bromeliads, few trees (escallonias) with *Tillandsia usneoides*, many shrubs, all heavily grazed.

Camp's notes on his collection (*E–4461*) of *Columellia oblonga* subsp. *oblonga* contain fairly complete data on the manner of growth and habitat of this plant in Ecuador (prov. Azuay, near Sevilla de Oro, elev. 8000–9000 ft.) — "This species flowers when quite young, specimens seen in the region in full flower and only about 1 m. high; it is fairly abundant on cut-over and burned areas which are regenerating (possibly from root-sprouts) where it might be taken for a shrub; also seen in forested areas, the tree easily detectable by the irregular contour of the trunk and the shreddy bark, one patriarch seen along this same quebrada at about 8,000 ft. elev. with a trunk diam. of nearly 2 m. (the top broken out of this tree and so no estimate can be given of maximum height)."

From the reports above, it appears that both *Columellia oblonga* subsp. *oblonga* and *C. obovata* are able to thrive under fairly harsh conditions imposed by burning, heavy grazing, and occasional drought. At least *C. oblonga* subsp. *oblonga* seems also to do well in forested areas and probably has the capacity to regenerate following fires, possibly by root sprouts. Like so many woody plants which can exist successfully under disturbed conditions, *C. oblonga* subsp. *oblonga* appears to be paedogenetic.

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THE ECOLOGY OF AN ELFIN FOREST IN PUERTO RICO, 3. HILLTOP AND FOREST INFLUENCES ON THE MICROCLIMATE OF PICO DEL OESTE

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A GENERAL DESCRIPTION of the geography and microclimate of Pico del Oeste is given in earlier reports in this series (Howard, 1968; Baynton, 1968). This report gives a more detailed analysis of both diurnal variations, and the differences above and below the canopy for rain and wind. The collection of cloud water is also described and its significance is discussed.

INSTRUMENTATION

A wind-driven generator was installed on top of a 20-foot tower to provide 12-v power for recording a number of meteorological events. The tower also supported an anemometer and a wind vane about 8 feet above the forest, and a tipping-bucket rain gage at tree top (see *fig. 2*, p. 420, Baynton 1968). A second anemometer was mounted within the forest about 6.5 feet above ground (see *fig. 7*, p. 425, Baynton 1968).

Rain below the forest was measured by means of a tipping-bucket gage of special design. Instead of the conventional round collector, a teflon-lined trough of equal projected area but 125 inches long and 0.9 inches wide was used in order to average out variations in the density of the canopy. Teflon was chosen because of its non-wetting characteristic. With the collector set at a slope of 10 degrees, entering drops move quickly to the exit funnel and thence to the tipping bucket.

Collection of cloud water was undertaken in order to evaluate the relative importance to the overall water budget of water impinging upon the trees from the cloud. FIGURE 1 is a photograph of the collector. Two layers of aluminum shadescreen, shown by the Pineapple Research Institute of Hawaii to be superior for this purpose (Ekern, 1964), were supported on a redwood frame, and laced together with brass wire at the bottom. A brass trough below the shadescreen carried the water through an orifice to a standard tipping-bucket collector. Calibration of the bucket in place on Pico del Oeste yielded 18.93 milliliters/bucket tip, which, when combined with the area of the collecting screen, yielded a calibration constant of 50.4 milliliters per square meter (ml/m^2) of cross section. This was rounded off to 50 ml/m^2.

The cloud-water collector was built to fit inside the thermometer shelter in order to exclude rain from the collected water. The location of the

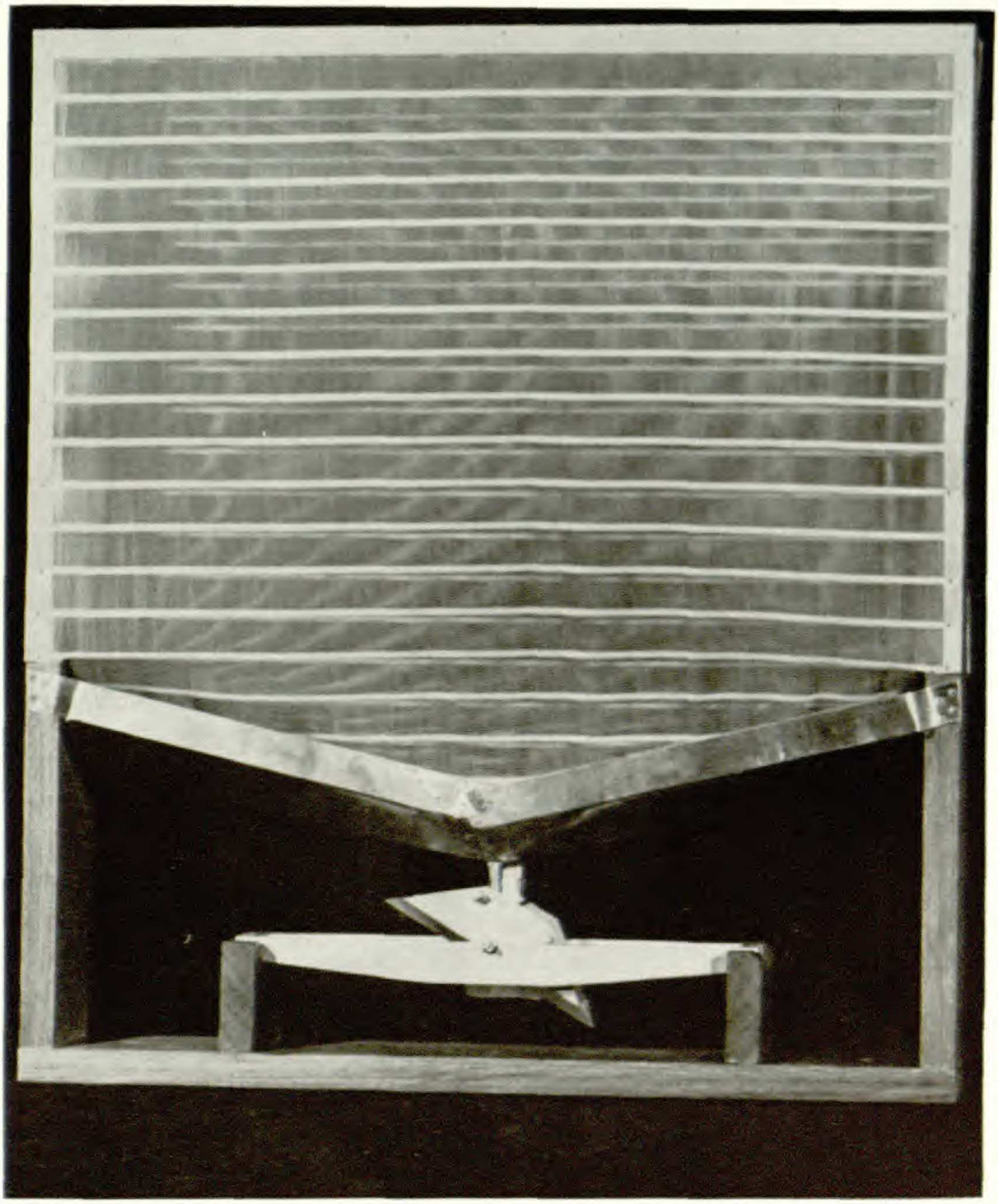

FIG. 1. Cloud-water collector.

thermometer shelter was just above the canopy (see *fig. 1*, p. 420, Baynton 1968) and the cloud-water collector was inside the shelter with its collecting surface approximately at right angles to the prevailing wind (see *fig. 3*, p. 421, Baynton 1968).

Each mile of wind passing an anemometer caused a switch closure that was recorded on a 20-pen event recorder and a 10-digit impulse printer set to print out and rezero at 1-hour intervals. The recorder and printer are shown in FIGURE 2. Each hundredth inch of rain collected by a tipping-bucket gage caused a switch closure that was recorded on the event recorder, and entered on the impulse printer. Each tenth and